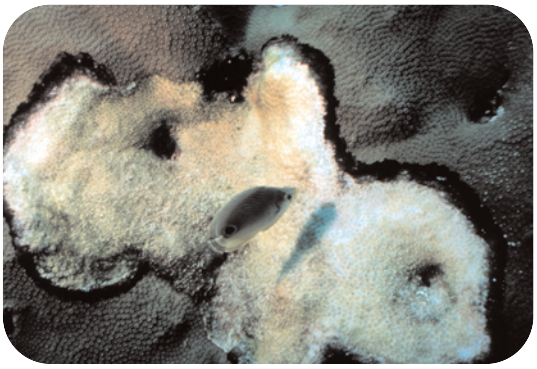
Coral Diseases in the Florida Keys

Erich Mueller Ph.D., Mote Marine Laboratory Center for Tropical Research

The first coral disease, "black-band", was described in 1973. As reef research increased, additional diseases were described and warnings issued about their potential impact on reefs. However, the first documented reef "epizootic" (equivalent to a human epidemic) involved the long-spined sea urchin, *Diadema antillarum*, rather than corals. These urchins suffered a massive mortality in 1983-1984 throughout the Greater Caribbean. The mortality has been attributed to a bacterium, *Clostridium botulina*, although this identification was not definitive. Because the urchins are major algae grazers on reefs, their loss has contributed to an abundance of algae that compete with corals and other bottom-dwelling reef animals for space.

Shortly thereafter, heavy losses of the elkhorn coral, *Acropora palmata*, were reported in the Caribbean due to "white-band" disease, greatly increasing concern about disease-related declines in reef health. This was accompanied by the increasing frequency and severity of "bleaching", events in which corals lose their symbiotic algae on a reef or larger scale. In 1997-1998 (coincident with an El Niño event), bleaching caused extensive mortality at the global scale. Bleaching is usually associated with high water temperatures and light, so it has often been considered separately from diseases that were known, or presumed, to be caused by infective pathogens. The broadest definition of disease is "an impairment of an organism's normal function", and may be biotic (i.e., an infective pathogen) or abiotic (i.e., physical or chemical factors). In at least one case, bleaching is caused by a bacterial infection.



The bacterial mat known as "black-band" has moved across this living coral head, leaving behind dead coral (lighter in color than living coral).

While a number of coral diseases and/or syndromes have been described, there are still many questions to be answered regarding causes. Pathogens have been identified for several diseases, but this is a difficult process because when tissue dies, many opportunistic organisms are found in addition to what actually caused the disease. Until the cause is confirmed, none of these may truly be considered diseases. For example, one widely reported disease turned out to be predation by parrotfish. Thus, the inclusive term "syndrome" (a group of signs typical of a disease, disturbance, condition or lesion) is perhaps more useful. Although many scientists feel that increased coral bleaching is linked to global warming, there is only circumstantial evidence at this time to associate coral diseases with human activities.

What impacts have coral diseases had on the Florida Keys? Outbreaks of black-band disease have been noted on reefs with high visitor use such as Looe Key since the 1980s. Techniques were developed to remove black-band disease from such areas. An apparent sharp increase in disease occurrence led to a Keys-wide, annual coral disease survey by Dr. Deborah Santavy (U.S. Environmental Protection Agency) starting in 1997. Disease incidence was relatively high in 1998, accompanied by extensive bleaching. The survey has also found that the Key West area has a statistically higher incidence of disease (10-25%) than the Dry Tortugas (1-5%). Other areas of the Keys generally have disease incidences between the values observed in Key West and the Dry Tortugas, but they are not statistically different from either. Surveys have also been conducted near the sparsely populated area of Lee Stocking Island (Exumas, Bahamas) where disease incidence was similar to the Dry Tortugas. Both bleaching and the other syndromes appear to be less common since 1999. There was considerable mortality in the Keys and Bahamas in 1998 due to bleaching and Hurricane Georges. Large stands of elkhorn coral died at Sand Key (near Key West), at Elkhorn Reef (Biscayne National Park) and other locations. The loss of disease-susceptible corals might be at least partly responsible for the lower disease incidence of corals seen since 1998.

Coral diseases appear to affect Caribbean reefs more than in the Pacific and Indian Oceans. However, the global distribution of bleaching events in 1997-1998 demonstrated that at least some coral diseases know no boundaries. With another El Niño expected in the next 1-2 years, numerous researchers will be anxious to see the effect of warmer waters on bleaching and other coral diseases. For more information visit: **www.mote.org**.

Note: This article appeared in the Summer/Fall 2001 issue of the newsletter of the Florida Keys National Marine Sanctuary, **Sounding Line**. *For more information, visit:* floridakeys.noaa.gov.